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Dates: Received: 23 November, 2017; Accepted: 28 December, 2017; Published: 29 December, 2017

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Case report

Titanium Mesh Reconstruction after Solitary Sternal Plasmacytoma Surgery-A Case report

Abstract

We present chest wall reconstruction with titanium mesh in a patient who underwent sternal resection due to solitary plasmacytoma (SP). A 35 year old female was admitted to The Thoracic Surgery Department of University Clinical Center Tuzla with pain and tender upper-sternal swelling. Thoracic magnetic resonance imaging (MRI) revealed hypo dense well-shaped rounded mass involving manubrium sterni which was 40mmx40mm in size measured by two right angle perpendicular diameters. Affected part was resected together with removal of sternoclavicular and costochondral junctions and reconstruction with titanium mesh was performed.

Introduction

Primary sternal tumors are very rare and account for only ~ 1% of primary bone neoplasms [1]. The most common lesion is chondrosarcoma (33%) followed by myeloma and plasmacytoma (30%), than (21%) lymphoma and occasional lesions like osteosarcoma, fibrosarcoma and Ewing sarcoma [2]. Surgical treatment requires adequate, wide margin resections and reconstruction of the anterior chest wall [3]. Reconstruction is essential for maintenance of respiratory function and for protection of mediastinal organs [4]. Here we report reconstruction of anterior chest wall with titanium mesh inserted between two polypropylene mesh sheets.

Case report

A 35-year-old female, with no significant past medical history, was admitted to our department with progressive anterior chest wall pain for the past 3 months. Physical examination revealed a palpable fixed mass involving sternal manubrium. Laboratory tests were unremarkable. MRI showed a solitary, well-shaped, hypo dense and round mass which involved manubrium sterni (40mm x 40mm in diameter) with no signs of subcutaneous invasion. A whole body computed tomography detected no metastatic deposits. The case was presented before thoracic team and it was decided to do radical resection.

We performed wide manubrial resection including right and left sternoclavicular joints and upper sternal part. Complete

specimen was sent to surgical pathology for rapid frozen section diagnosis and pathologist recommended to wait until final analysis. However, considering that all primary sternal tumors are malignant [5] we didn't wait for final diagnosis but proceeded with resection of both clavicle sternal end and the first and the second rib cartilages. To reconstruct and stabilize anterior chest wall a titanium micro mesh (KLS Martin Germany - Ti100mm x 100mm/0.2mm thickness) was used. It was placed over polypropylene mesh to protect major vessels and pericard from direct contact with rigid titanium and fixed to the remaining edges of sternum, clavicles and ribs. Another polypropylene mesh was placed over titanium to avoid contact with subcutaneous tissue and to secure stability of thoracic wall. It was then covered with subcutaneous tissue without use of any myocutaneous flaps [Figures 1-3].

Two hours before surgery patient received Cefazolin 1g and 500mg every 8hours for 24 hours postoperatively in five days. Intravenous tramadol and metamizol provided satisfactory analgesia after surgery. On 4th postoperative day, pleural drainage tube was removed, the patient recovered well and was discharged on postoperative day 7. The pathological examination revealed neoplastic plasma cell proliferation with eccentric nuclei and eosinophilic cytoplasm. Immunohistochemical analysis was positive for CD138 and kappa-light chains and negative for lambda-light chains, S 100 protein, CKAE1 AE3, CK7 and EMA. The final pathological diagnosis was plasmacytoma. One year after surgery patient is doing well under hematological and surgical follow up.



Discussion

Primary tumors of the sternum are generally malignant and account for only 0.5–1% of all primary bone neoplasms. Sternal solitary plasmacytoma, a type of malignant tumor, is characterized by localized monoclonal plasma cell infiltration without evidence of multiple myeloma and represents less than 10% of all plasma cell neoplasms [6].

In an analysis of 11087 cases of bone tumors done at Mayo Clinic, only 66 (0.6%) were primary sternal. Of these 66 tumors, 22 (33%) were chondrosarcomas; 20 (30%) were myelomas including plasmacytomas; 14 (21%) lymphomas, 8 (12%) osteosarcomas, 1 (1.5%) fibrosarcoma and 1 (1.5%) Ewing tumors [2].

The most common site of SP is vertebral column. The involvement of ribs and sternum accounts for 10–15% of cases. Males are two times more frequently affected than females which makes sternal plasmacytoma being very rare. [5]. Radiological examination of sternal solitary plasmacytoma usually presents as an osteolytic expansive lesion or a typical ‘punched-out’ lytic lesion. Plasmacytoma destroys bone cortex in several places and invades soft tissues. On MR imaging, these tumors exhibit a low signal intensity on T1 and a high signal intensity on T2-weighted images [7].

Although radiotherapy is recommended for sternal SP, extensive wide resection and reconstruction of anterior chest wall is still treatment of choice [5,8,9]. The goal of wide resection is to ensure that all malignant tissue has been excised resulting in local control.

Reconstruction of sternal defect is essential to maintain original respiratory function and to protect mediastinal organs. The choice of reconstruction technique depends on the extent and localization of the defect using various prosthetic and homologous materials, including synthetic and metallic grafts, pedicled skin and muscle flaps, free skin grafts, fascia lata and autologous bone transplants [10].

Recently, titanium mesh has emerged as promising material for sternal reconstruction in cases of sternal defect larger than 5 cm without using additional autologous tissue. Due to its biocompatibility and flexibility titanium mesh has been acknowledged as versatile and easy to implement [11]. Polypropylene mesh is used more frequently for the reconstruction of sternal defects but its lack of rigidity may result in paradoxical chest wall motion [10]. Titanium mesh is may be complicated by infection or fragmentation of the graft, but it is more rigid and osteconductive than polypropylene mesh and mold to shape of the defect. It is easy to handle, minimally elastic, less visible on MRI than stainless steel and adapts well to surrounding soft tissues [10–12]. Our patient was extubated in the early postoperative period, and paradoxical respiration was not observed during 12 months postoperatively. In the present case the titanium mesh, embedded between two polypropylene meshes, was used for anterior chest reconstruction without use of musculocutaneous flap. The benefits for patients are simplifying the procedure, ideal rigidity and biocompatibility.

Further advantages include minimal trauma, no infection and no change in pulmonary function [13].

In conclusion, we presented a wide manubrial resection and reconstruction with titanium mesh between two polypropylene meshes for a solitary plasmacytoma. This resection and reconstruction can be performed successfully and effectively in patients with large sternal tumors. We suggest that titanium mesh may be highly beneficial material for sternal reconstruction.

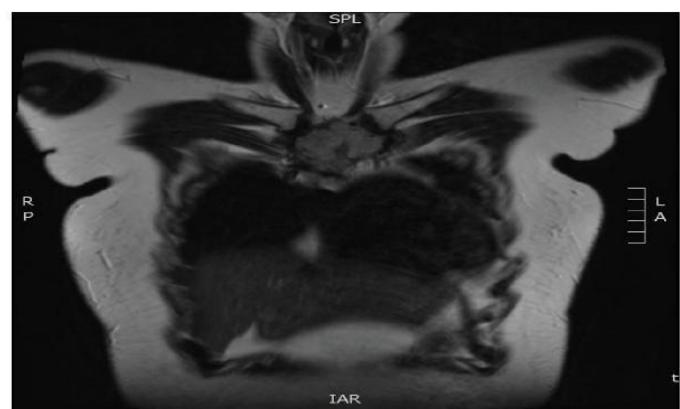


Figure 1: MRI anteroposterior view – manubrium sterni tumor.



Figure 2: MRI lateral view of the chest with tumor.



Figure 3: Titanium MESH before closing the operative wound.



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